**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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| IN RE THE APPLICATION OF | ) | Fedja Bobanovic |
| SERIAL NO.: | ) | 10/531,007 |
| FILED: | ) | 10/13/2005 |
| FOR: | ) | Imaging Apparatus including State Machine Controller |
| CUSTOMER NUMBER | ) | 23644 |
| CONFIRMATION NO. | ) | 2701 |
| ART UNIT: | ) | 2872 |
| EXAMINER: | ) | Thong Q. Nguyen |
| ATTORNEY DOCKET NO. | ) | 920602-99281 |

## APPEAL BRIEF

Honorable Director of Patents and Trademarks
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir,

This appeal is being filed in view of the Examiner's final Office Action of October 27, 2010. An appropriate Notice of Appeal and Petition for Extension of Time were filed with the Patent and Trademark Office on February 23, 2011.

The brief fee of $540.00 pursuant to 37 C.F.R. §41.20(b)(2) has been tendered upon filing of this Brief. Any further fees deemed necessary should be deducted from, or credits made to, Deposit Account No. 12-0913.

## (i) REAL PARTY IN INTEREST

This application is assigned to PerkinElmer Singapore PTE Ltd., who is the real part in interest.

## (ii) RELATED APPEALS AND INTERFERENCES

There are no known prior and pending appeals, interferences or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the present appeal.

## (iii) STATUS OF CLAIMS

When this nationalization was filed with the Patent and Trademark Office on April 12, 2005, claims 1-31 were cancelled, and new claims 32-62 were substituted. During the prosecution of the application, claims 35-47 and 50-62 have been withdrawn from consideration, leaving claims 32-34 and 48 and 49. Those claims have been finally rejected, and are the claims being appealed. Claims 32-34 and 48 and 49 are set forth in the Claims Appendix.

## (iv) STATUS OF AMENDMENTS

Following the Examiner's final Office Action, an amendment was filed on December 13, 2010, slightly amending independent claims 32 and 48. That amendment has been entered by the Examiner, as indicated in the Advisory Action of December 16, 2010.

## (v) SUMMARY OF CLAIMED SUBJECT MATTER

Claim 32

The invention describes an apparatus by which light emitted from a specimen is imaged to produce a video signal for creating an image in a display device or for processing an analysis (as set forth in the Abstract). Claim 32 is directed to a confocal scanning arrangement e.g. as shown in outline in Figure 1. In the following discussion all references are to the PCT specification as published, WO 2004/036898. The claimed apparatus includes the following elements:

- means for mounting a specimen, e.g. microscope sample stage 12 (page 25 line 10, page 18 line 11 to page 19 line 3).

- a light source for producing excitation light (for scanning a specimen), e.g. AOTF laser

system 16 (page 25 lines 8 to 12, page 26 lines 5 to 11, page 26 lines 15 to 20 (Figure 3), (page 8 line 22 to page 10 line 23, page 19 line 6 to page 20 line 22).

– a confocal scanning system, e.g. system 10 (page 25 lines 8 to 10, page 3 line 19 to page 5 line 7, page 13 line 17 to page 15 line 7.

– an image capture device, e.g. camera 14 (page 25 line 10, page 26 line 10, page 4 line 1, page 11 line 5 to page 12 line 4, page 22 line 13 to page 23 line 12).

– control means (page 10 line 24 to page 11 line 4) comprising

– a host computer e.g. PC 20 (page 25 line 13, page 25 lines 23 to 25, page 32 line 6)

– a state machine controller e.g. controller 18 and 8051 microcontroller shown in Figure 5 (page 25 lines 13 to 14, page 25 lines 21 to 22 (Figure 2), page 32 line 6, page 32 lines 9 to 11 (Figures 2, 4 and 5)).

– the host computer being arranged to supply state data to the state machine controller (page 25 lines 15 to 17, page 27 lines 12 to 18, page 26 line 14).

– the state machine controller (described at page 26 line 21 onwards with respect to Figures 4 to 6) having

– a state counter (item 60, Figure 4).

– a state memory (item 62, Figure 4).

– a duration down counter receiving a clock signal (item 58, and clock signal 69, Figure 4).

– the state machine controller.

– controls the scanning system (head sync 56 (Figure 4) page 27 lines 1 to 2), end of scan sync (Figure 1) and confocal sync pulse (Figure 2).

– controls excitation light source (line on/off 48 to laser in Figure 4 and page 27 lines 1 to 2).

– controls image capture device (camera 54 to camera trigger in Figure4, page 27 lines 1 to 2).

– the control being such that for each image to be formed at the image capture device, light from the specimen is only incident on the image capture device for a specific time period equal to that required by the scanning system to scan the area of interest n times where n is a whole number equal to or greater than 1 (page 3 lines 10 to 14, page 13 lines 9 to 16, page 29 lines 11 to 22).

Claim 48

The above description of claim 32 applies equally to claim 48, as all elements of method claim are present in apparatus claim 32. The reader is thus referred to that explanation, and for convenience it is repeated immediately below:

The invention describes an apparatus by which light emitted from a specimen is imaged to produce a video signal for creating an image in a display device or for processing an analysis (as set forth in the Abstract). Claim 32 is directed to a confocal scanning arrangement e.g. as shown in outline in Figure 1. In the following discussion all references are to the PCT specification as published, WO 2004/036898. The claimed apparatus includes the following elements:

- means for mounting a specimen, e.g. microscope sample stage 12 (page 25 line 10, page 18 line 11 to page 19 line 3).

- a light source for producing excitation light (for scanning a specimen), e.g. AOTF laser system 16 (page 25 lines 8 to 12, page 26 lines 5 to 11, page 26 lines 15 to 20 (Figure 3), (page 8 line 22 to page 10 line 23, page 19 line 6 to page 20 line 22).

- a confocal scanning system, e.g. system 10 (page 25 lines 8 to 10, page 3 line 19 to page 5 line 7, page 13 line 17 to page 15 line 7.

- an image capture device, e.g. camera 14 (page 25 line 10, page 26 line 10, page 4 line 1, page 11 line 5 to page 12 line 4, page 22 line 13 to page 23 line 12).

- control means (page 10 line 24 to page 11 line 4) comprising

- a host computer e.g. PC 20 (page 25 line 13, page 25 lines 23 to 25, page 32 line 6)

- a state machine controller e.g. controller 18 and 8051 microcontroller shown in Figure 5 (page 25 lines 13 to 14, page 25 lines 21 to 22 (Figure 2), page 32 line 6, page 32 lines 9 to 11 (Figures 2, 4 and 5)).

- the host computer being arranged to supply state data to the state machine controller (page 25 lines 15 to 17, page 27 lines 12 to 18, page 26 line 14).

- the state machine controller (described at page 26 line 21 onwards with respect to Figures 4 to 6) having

– a state counter (item 60, Figure 4).

– a state memory (item 62, Figure 4).

– a duration down counter receiving a clock signal (item 58, and clock signal 69, Figure 4).

– the state machine controller.

– controls the scanning system (head sync 56 (Figure 4) page 27 lines 1 to 2), end of scan sync (Figure 1) and confocal sync pulse (Figure 2).

– controls excitation light source (line on/off 48 to laser in Figure 4 and page 27 lines 1 to 2).

– controls image capture device (camera 54 to camera trigger in Figure4, page 27 lines 1 to 2).

– the control being such that for each image to be formed at the image capture device, light from the specimen is only incident on the image capture device for a specific time period equal to that required by the scanning system to scan the area of interest n times where n is a whole number equal to or greater than 1 (page 3 lines 10 to 14, page 13 lines 9 to 16, page 29 lines 11 to 22).

## (vi) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

There are two grounds of rejections to be reviewed in this appeal:

1. Claims 32 and 48 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Endo et al. (US 2002/0097490), hereinafter "Endo" in view of Wolf et al. (US 4,972,258), hereinafter "Wolf" and King et al. (US 6,122,396), hereinafter "King".

2. Claims 33-34 and 49 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Endo in view of Wolf and King as applied to claims 32 and 48, and further in view of Morita et al. (US 2002/0067477), hereinafter "Morita".

## (vii) ARGUMENT

Ground 1

In the final Office Action, the Examiner rejects independent claims 32 and 48 under 35 U.S.C. § 103(a) as being unpatentable over Endo in view of Wolf and King, the latter of which was cited for the first time. The rejection is in error.

The primary reference, Endo, discloses in Figure 19 a confocal scanning arrangement that includes a computer 86 and a control circuit 78, with no detail being given of circuit 78. This arrangement is discussed in paragraphs 0219 to 0228 of Endo. The control circuit 78 of Endo synchronizes the operation of a CCD camera 46 and the rotary motion of disc 102 of a confocal scanning system. However, control circuit 78 is not a state machine controller (having a state counter, a state memory and a duration down counter which receives the clock signal), and the control circuit 78 does not control the scanning system, the excitation light source and the image capture device so that, for each image to be formed at the image capture device, light from the specimen is only instant on the image capture device for a specific time period to that required by the scanning system to scan the area of interest n times where n is a whole number equal to or greater than 1.

This distinction of the present invention over Endo is acknowledged in the final Office Action of October 27, 2010.

This distinction over Endo is of major significance. In the system of the present invention, very precise close control of the scanning system together with the excitation light and the image capture device is required to ensure that the operation of these components is properly synchronized. This is necessary to coordinate and synchronize the components to provide a good quality image free of defects and artefacts. The present inventors have determined that use of a dedicated controller programmed to function as a state machine enables this objective to be achieved in a way that is not possible with a general purpose computer or controller, according to instructions from the user indicating the protocol that is to be followed in a given process.

Another important feature of the present invention not present in Endo is the requirement that the host computer is arranged to supply state data to the state machine controller. This distinction is also acknowledged in the office action of October 27, 2010.

This feature of the present invention is of practical significance in that the state machine controller can be readily programmed by supplying new state data from the computer, e.g. in the form of a state table for execution by the controller. This makes operation of the system of the present invention particularly versatile and flexible in that reprogramming is readily achievable.

In the office action of October 27, 2010, the Examiner cites Wolf as allegedly meeting the first distinction. The applicants do not agree with this view.

In the present invention the state machine controller controls the scanning system, the excitation light source and the image capture device in a synchronized manner in response to signals from a state counter. Thus all of these components are controlled by the state machine controller. Wolf does not disclose an arrangement having such a controller.

Wolf concerns a scanning laser microscope arrangement that is technically complex. Wolf includes two separate optical systems, a main system and a subsystem.

An annotated version of Figure 1 of Wolf, showing the main optical system in red and the optical subsystem in green, is set forth on page 9 hereof. In the main optical system, a photodetector 90 detects light from a first light source 22 (Figure 1 columns 5 to 7). In the second subsystem, light from a second light source 98 is used to provide information on the position of the light beam in the first system for control purposes. The second subsystem is described generally at column 7 line 57 to column 9 line 6. The second subsystem includes a frame storage control module 140, represented in Figure 2 and shown in more detail in Figures 9 and 10 and described, e.g. in columns 21 to 23. Module 140 uses clock signals and counters to process signals relating to the position of the scanning beam of the first system to provide information to control computer 86. However, it is important to appreciate that module 140 forms only one element of the control arrangement of the Wolf equipment. In particular, it should be noted that module 140

merely provides information on the position of the scanning beam and plays no role in the control of the excitation light source (laser 22) or the image capture device (photodetector 90).

The Wolf arrangement is thus entirely different from the present invention, where the state machine controller governs and coordinates the timing of the scanning system, excitation light source and image capture device, so that these are all very precisely regulated and mutually synchronized as noted above.

Although the Wolf apparatus includes a control module 140 that uses clock signals and counters, the module 140 of Wolf is not in any way comparable to the state machine controller of the present invention. Wolf therefore does not satisfy the first distinction of the present invention over Endo noted in the office action of October 27, 2010.

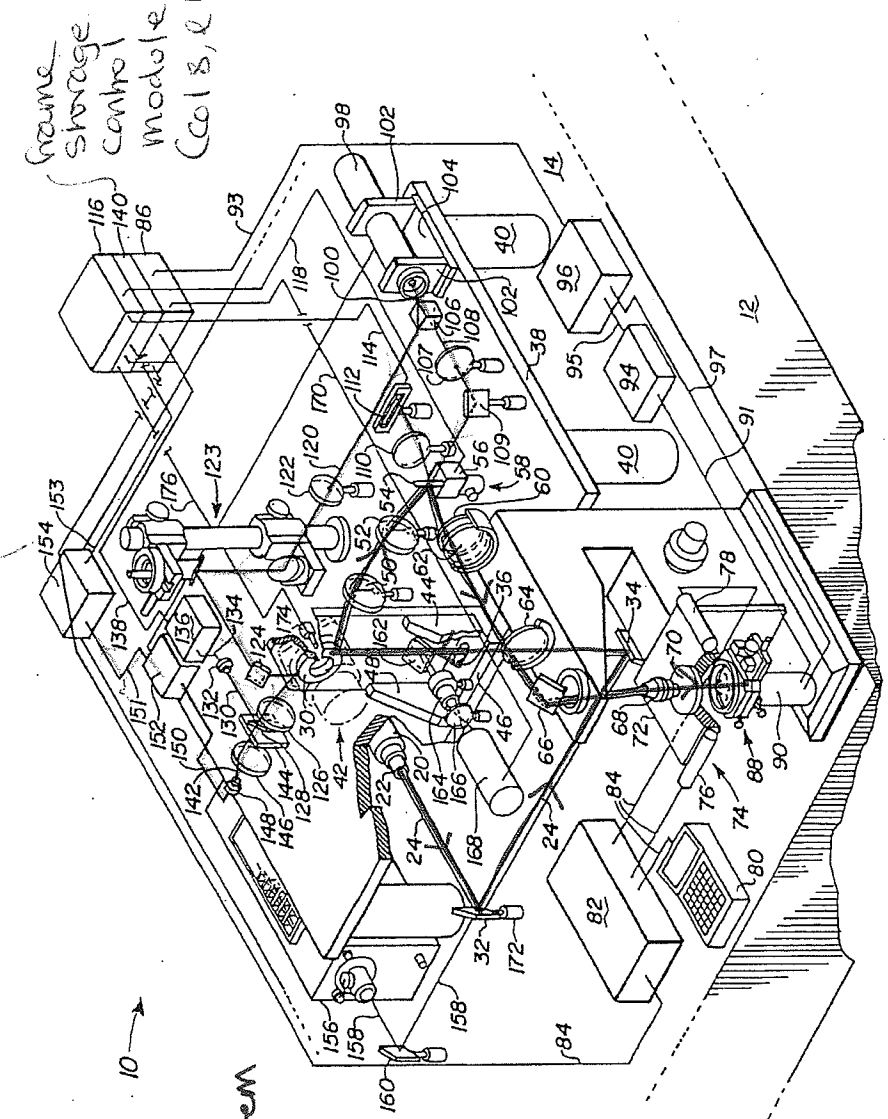
Pixel clock module (Col 8, & 67)
Frame storage control module (Col 8, & 67)
10 — main optical system

Fig. 1

The Office Action of October 27 2010 refers to King in connection with the second distinction made above, but applicants do not agree with the views expressed in the action.

King concerns a fluorescence microscope for examining stained microorganisms, which includes a computer 10 for controlling various components, particularly illumination subsystem 20, imaging subsystem 30, optical subsystem 40 and mechanical subsystem 50, as illustrated schematically in Figure 1. Figure 1 shows the flow of information from the computer 10 to the various subsystems, represented by arrowheads, and in some cases there are additional arrowheads which presumably represent flow of information back to the computer. The office action does not refer to any particular passages of King, but simply refers generally to Figure 1 and columns 5 to 8 as disclosing computer control with feedback.

The applicants simply do not see the relevance of King to the present invention.

King is not concerned with improving timing coordination of a confocal scanning microscope. The control arrangement of King is not in any way comparable to the control arrangement of the present application: King does not use control means comprising a host computer and a state machine controller. Consequently, there is no disclosure in King of an arrangement in which the host computer is arranged to supply state data to the state machine controller. The two way flow of information possibly disclosed in King completely irrelevant in this connection.

This feature of the present invention is not concerned with feedback of information. Instead, it relates to the supply of state data from the host computer to the state machine controller. As noted above, this brings benefits in terms of ready reprogramability of the controller and has versatility of the apparatus.

A simple graphic representation of the differences between the applicants' arrangement and King is included in the Evidence Appendix. This was attached to the response of December 10, 2010. The differences are clear and substantial.

Plainly, King would not lead a skilled reader of Endo and Wolf to the claimed invention.

The Examiner's allegation that this is the case relies on the use of impermissible hindsight. The Examiner's assertion on page 5 of the office action of October 27, 2010 that modifying Endo and Wolf "by using a two-way connection" results in control means in which a state machine controller steps components through a sequence of coordinated states defined in data received from a computer is plainly not correct.

Furthermore, it should be noted that Endo and Wolf have very different architectures and are not compatible. It would not be a simple matter to combine the systems of Endo and Wolf as the Examiner has suggested. In any event, such combination would not result in the present invention, as explained above. In particular, there is no teaching in any of the prior art of a state machine controller controlling the scanning system, the excitation light source and the image capture device in the manner specified in the claims of the present application. There is also no teaching in any of the prior art of control means including a host computer supplying state data to a state machine controller.

Applicants therefore reject the assertion that one skilled in the art would even consider combining the teachings of the three references, Endo, Wolf and King. However, even if the teachings of these three references were somehow combined they would not produce the arrangement as presently claimed.

In the Examiner's Advisory Action of December 16, 2010, the Examiner raises three specific points, which are addressed as follows:

(a) The Examiner comments that applicants' argument that components are controlled in a very precisely synchronized manner (by the state machine controller) does not relate to claimed features. Applicants contend that this is not a fair point, in that the claims do specify that the state machine controller is adapted to control the various components. This means that the components will be controlled in accordance with the state data supplied to the state machine controller, with the synchronism and co-ordination that follow. In any event, even if the limitation is not precisely specified in the claims, the precise control that is made possible by use

of a state machine controller is a consequence of the invention as claimed and there is no reason why applicants should not refer to this in support of their invention.

(b) The Examiner comments that in Wolf module 140 controls light source 98 which provides "excitation light", going on to comment that applicants' claims do not provide any specific limitations on "excitation light". This is not true. Claim 32 specifically requires that excitation light is used to scan the specimen by the action of the confocal scanning system. Claim 48 is similar. Light from Wolf's light source 98 is not used to scan the specimen, and so is not "excitation light". Instead, Wolf's light source 98 is part of a second sub-system that is used to provide information for control purposes. It is light from first light source 22 in the main optical system of Wolf that scans the specimen.

(c) The Examiner comments that King is cited to show that a computer is used to control a plurality of operable components. Applicants do not dispute that it is known to use a computer in this way. However, applicants contend that this has no bearing on the question of the patentability of the present claims. Applicants dispute that it would have been obvious to arrive at the particular claimed subject matter as explained above.

It is therefore submitted that the Examiner's rejections of claims 32 and 48 are clearly in error, and should be reversed.

Ground 2

The remaining claims depend from their respective independent claims 32 or 48. As claims 32 and 48 are submitted to be allowable, the dependent claims are submitted to be allowable, as well.

## CONCLUSION

For the reasons set forth above, the Examiner's rejections are in error, and should be reversed. Such action is therefore solicited.

Respectfully submitted,

April 20, 2011

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## Claims Appendix

1 – 31. (cancelled)

32. An apparatus by which light emitted from a specimen is imaged by an image capture device to produce a video signal for creating an image in a display device or for processing and analysis, comprising:

- means for mounting the specimen,

- a light source for producing excitation light,

- a confocal scanning system adapted to direct excitation light in one direction towards, and thereby to scan an area of the specimen and also adapted to convey light emitted from the specimen as a consequence of the excitation light incident thereon, in another direction, which operates in use to scan typically repeatedly an area of interest of the specimen,

- an image capture device having discrete spatially distinct light sensitive regions on which light emitted from the specimen is focussed to form an image after being conveyed through the scanning system in said other direction, and

- control means comprising a host computer and a controller, the controller being programmed to function as a state machine, with the host computer arranged to supply state data to the state machine controller, the state machine controller having a state counter, a state memory and a duration downcounter which receives a clock signal and being adapted to control the scanning system, the excitation light source and the image capture device so that, for each image to be formed at the image capture device, light from the specimen is only incident on the image capture device for a specific time period equal to that required by the scanning system to scan the area of interest n times where n is a whole number equal to or greater than 1.

33. The apparatus as claimed in claim 32 further comprising shutter means which in use is operated by signals from the control means to interrupt light from the excitation light source except for when the specimen is to be illuminated wherein the shutter means comprises an acousto-optic element.

34. The apparatus as claimed in claim 33 further comprising second shutter means between the scanning system and the image capture device, which second shutter means is operated by signals from the control means so that in use light is prevented from reaching at least part of the image capture device, except for the specific period of time during which excitation light is incident on the specimen, for the purpose of reducing errors which arise from phosphorescence, afterglow, or stray reflections, reaching the image capture device.

35-47. (withdrawn)

48. A method of imaging light from a specimen comprising passing excitation light to the specimen via a confocal scanning system and passing light emitted by luminescence of the specimen in another direction via the scanning system to an image capture device having a sensor having discrete spatially distinct light sensitive regions, wherein the scanning system is operated so as to scan the whole of an area of interest of the specimen, and wherein the scanning system, the excitation light and the image capture device are controlled by a controller that is programmed to function as a state machine, with the state machine controller receiving state data from a host computer, the state machine having a state counter, a state memory and a duration downcounter which receives a clock signal, so that, for each image to be formed at the image capture device, light emitted from the specimen is only incident on the image capture device sensor for a specific time period equal to that required for scanning the whole of the area of interest n times where n is a whole number equal to or greater than 1.

49. The method as claimed in claim 48 wherein shutter means is provided which operates to prevent light reaching at least part of the image capture device sensor, except for said specific period of time during which the excitation light is incident on the specimen, for the purpose of

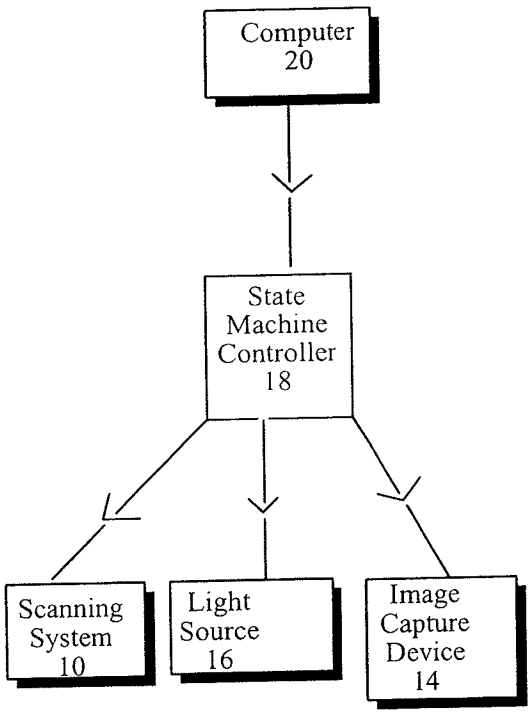
reducing errors which can arise from light arising from phosphorescence, afterglow, or stray reflections, from reaching the image capture device sensor.

50-62. (withdrawn)

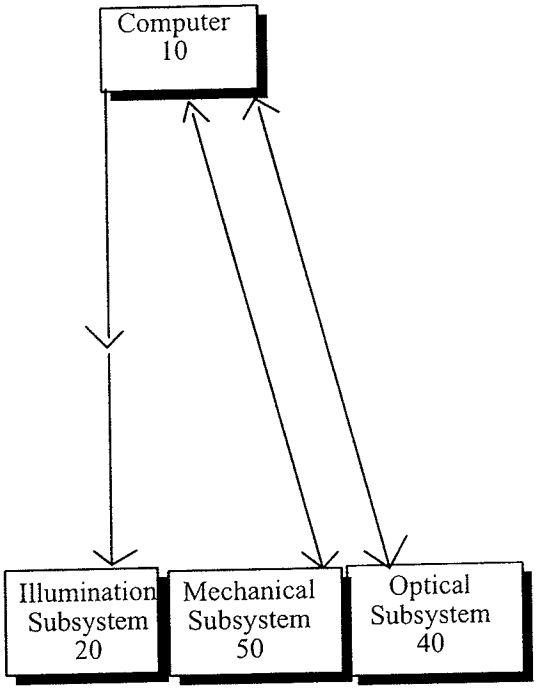
## Evidence Appendix

The following was an attachment to the December 10, 2010 after final response, which has been entered.

Present application




King



## Related Proceedings Appendix

None.